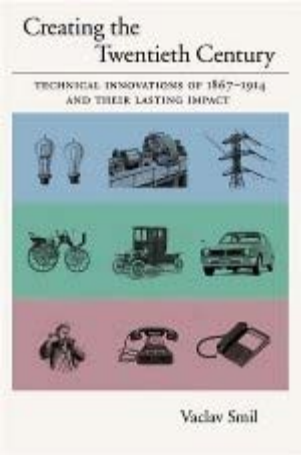

Title: *Creating the Twentieth Century*
Author: Vaclav Smil
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Rating: 90%

Creating the Twentieth Century is professor and prolific author Vaclav Smil's "homage to the creators of a new world." As he explains in the introduction, “This was the time when the modern world was created, when the greatest technical discontinuity in history took place."

Yet this "technical discontinuity" began decades before the date of 1867 that Smil uses as the starting point for his survey. If one only looks at a few great technical changes - the steam engine, the telegraph, the cotton gin, and the rotary printing press - the bouleversement that these inventions engendered was tremendous. They led to the expansion of, respectively, people and goods, information, slavery, and literature. Nevertheless, one could choose any arbitrary dates as the beginning and end of this period. While 1914 is seen as the end, because it is the period when World War I began, Smil chose 1867, somewhat arbitrarily, because it marks the birth of the second law of thermodynamics, dynamos built without permanent electromagnets, dynamite, and the sulfite pulping process, as well as the design of the first typewriter and Marx's *Das Kapital*. While this latter work has little to do with technology, it does mark a watershed in the reflection of how humans interact with technology, being a direct result of the second industrial revolution in England.

Radical Change

Looking at an overview of the technological advances that occurred during this period, many of which we take for granted, is quite astounding. In the years between 1867 and 1880, such devices as the telephone, sound recordings, typewriters, chemical pulp and reinforced concrete saw the light. This latter innovation allowed for the building boom that helped build larger cities in the United States, as it reconstructed after the Civil War. The 1880s, a huge period of scientific advances, brought incandescent electric lights, electric motors and trains, the gramophone, a spread of photography (a technology initially developed decades earlier), internal combustion engines, aluminum production, and more. The 1890s saw the introduction of diesel engines, x-rays, movies, wireless telegraphy, the discovery of radioactivity and the synthesis of aspirin.

And the period from the turn of the century through 1914 saw the sudden upsurge of mass-production, especially of automobiles, which changed the United States from a horse-drawn society to a motorized one. It also was the period when the first airplanes and tractors were developed; when vacuum diodes and triodes were perfected; and when air conditioning, stainless steel and neon lights became elements of the modern world.

Smil separates all of these innovations into four groups, examining each in its own chapter: electricity, the internal combustion engine, high-performance materials and chemical synthesis, and communication and information. He then looks at how these innovations change civilization, and finally examines how our world sees these advances.

Throughout the book, Smil gives an overview of how these technologies were developed and refined, starting from initial discoveries, perhaps decades before his period of reference, and presenting the applications of these technologies that became commonplace and how they changed the way people lived and worked. He does not go into great detail on any of these technologies, but his surveys are sufficient for this context. It can be somewhat humbling, reading this book, to see how much changed in such a short time. Comparing, say, the beginning of the 19th century with its last years shows that western civilization made a great leap forward that was unprecedented, and would not be equaled until the information revolution at the end of the last century.

Technology's Effects on Society

Smil attempts to link these technological changes with cultural elements of the same period, though some of his conclusions are dubious. While citing Jules Verne is a given, it is difficult to find many other works of literature that truly reflect these changes. As an avid reader of 19th century literature myself, I am often surprised at the lack of any "gee-whiz" feeling that pervades these works. It is as if people took these changes in stride so easily that they seemed second nature; or they simply did not realize how important they were. Electricity was probably the most radical change for everyday life: if one ignores the motors and machines it made possible, the mere existence of electric lights was a true revolution. However, this electrification did not occur overnight, and took decades to reach the mass of people. (While Edison began providing electricity to a small part of New York City in 1883, it wasn't until 1912 that all of Manhattan had access to this form of power.)

The internal combustion engine - one of this period’s greatest developments, yet one that has the most environmental impact - followed a similar rate of adoption. While the first two-stroke engine was presented in 1867, the success of this device came when it was added to vehicles, first to a bicycle in 1885, then later to a "horseless carriage" in 1886. The perfection of this technology, coupled with other technologies that allowed for mass-production of automobiles, and combined with the business savoir-faire of Henry Ford, led to the incredibly rapid adoption of motorized vehicles. Instead of selling a "luxury" product, designed only for the well-to-do, Ford saw the huge market in not only urban populations, but also those settling new parts of the United States. For this reason, he gave his cars enough clearance to not only navigate on muddy roads (the norm at the time) but also drive through fields.

While the United States in this period was expanding westward at an ever-increasing rate, with the principal of Manifest Destiny holding forth, it was

also welcoming a record number of immigrants. Not only did the country need to expand horizontally, but also vertically to house people, and to provide offices for them to work in. Improvements in steel production, and the development of reinforced concrete, gave engineers the materials they needed to begin building skyscrapers. At first, these buildings were merely a dozen floors high, but they quickly grew to reach dizzying heights, culminating in 1930 with the completion of the Empire State Building. Of course, materials alone did not lead to this verticality; electric elevators were necessary for people to get to these sky-high floors, and they, too, were invented in this period (the first electric elevator was used in 1887).

The fourth major area of advancement was in communication and information. The telephone, advances in printing presses and typesetting, the typewriter, improvements in paper manufacture, movies, photography, the gramophone, the radio; all these innovations were developed or refined during this crucial period. All these individual innovations combined to change the way information was spread; and the effect of this was probably more disruptive than the information revolution of the late 20th century.

A Gradual Revolution

This engaging book looks at so many innovations that one may feel that this period underwent sudden, revolutionary changes. Yet that was not the case. These changes all came gradually, adding one to another, leading to a paradigm shift, but one that was essentially part of everyday life. People came to accept the inevitability of technological change, and that is probably the most interesting aspect of the period. I would welcome more discussion and analysis of the sociology of these technological changes, as well as the cultural impact. How much did the use of half-tones (a technique still used today to print photographs in newspapers) change the way people saw the world? Before this development, they were limited to seeing drawings or etchings in newspapers, though they could see photographs of major events in galleries (such as Matthew Brady's many daguerreotypes of the Civil War, which he exposed in his own studios). Or just how much did the typewriter change literature? Authors could type their works, making them more readable (though few adopted this new technology during this time), and Henry James, suffering from "writer's cramp" began dictating his works to a typist in the early 20th century, developing, from this spoken rather than written creative activity, his "later style", with much longer, more convoluted sentences.

While Smil mentions the "period's incredible artistic creativity," he suggests - perhaps ludicrously - that we would not have "any, or most, compositions" by Brahms, Bruckner, Mahler, or Ravel, among others; nor the literary works of Tolstoy, Kipling or Zola; nor the paintings of the French impressionists. This is a bold statement, and one that bears little grounding. For these geniuses would have composed, written and painted, perhaps differently; but genius is genius, and they would still have created. Take away electricity, for example, and they still would have written their masterpieces. Henry James would still have written his great works; *War and Peace* would still have been penned; and, no doubt, Mahler would have composed his astounding symphonies, perhaps in a slightly different form.

Conclusion

All in all, this is a fascinating book, limited to the technologies themselves and not examining enough the impact these inventions had on daily life. But the story of this massive period of technological innovation is an exciting one, and one that deserves better recognition. Smil has done a fine job of examining this period here, and I look forward to his next work, to be titled *Transforming the Twentieth Century*, which will follow these same technologies and how they were improved throughout the century.

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